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BIOCHIP TECHNOLOGIES GMBH et al.
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Claims

1. Polyfunctional polymer monolayer comprising an assembly of polymer chains attached to a surface obtainable by a process comprising the steps of:

   a) covering the surface with a monolayer of a polymerization initiator which comprises one or more functional groups suitable for attachment to the surface; and

   b) initiating and carrying out a polymerization reaction in the presence of monomers carrying functional groups which allow a coupling reaction of the obtained polymer chain with specific sample molecules,

   wherein each polymer chain comprises a multitude of identical or different units carrying one or more functional groups which allow an interaction of the polymer with a sample or probe molecule.

2. Polymer monolayer according to claim 1, wherein the polymer chains are covalently attached to the surface.

3. Polymer monolayer according to claim 1 or 2, wherein the functional groups are chosen from carboxylic acids, maleinimides, N-hydroxy succinimides, epoxides, isothiocyanates, isocyanates or azides.

4. Polymer monolayer according to any of claims 1 to 3, wherein the sample molecule or probe molecule is chosen from proteins, peptides, polysaccharides or nucleic acids and derivatives thereof.

5. Polymer monolayer according to any of claims 1 to 4, wherein the polymer comprises segments that make the layer water swellable.

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6. Polymer monolayer according to claim 5, wherein the water swellability is provided by monomers chosen from acrylic acid, methacrylic acid, dimethyl acrylamide or vinyl pyrrolidon.

7. Polymer monolayer according to any of claims 1 to 3, 5 and 6, further comprising a multitude of identical or different probe molecules immobilized at the polymer chain via a reaction with the functional groups.

8. Polymer monolayer according to claim 7, wherein the probe molecules are selected from nucleic acids, PNAs, polysaccharides, proteins and peptides.

9. Surface carrying a polyfunctional polymer monolayer according to any of claims 1 to 8.

10. Surface according to claim 9, wherein the polymer chains are in the form of patterned arrays.

11. Process for the production of a polyfunctional polymer monolayer according to any of claims 1 to 8, comprising the steps of:

a) covering the surface with a monolayer of a polymerization initiator which comprises one or more functional groups suitable for attachment to the surface; and

b) initiating and carrying out a polymerization reaction in the presence of monomers carrying functional groups which allow a coupling reaction of the obtained polymer chain with specific sample molecules.

12. Process according to claim 11, wherein the initiator comprises a chlorosilane, an alkoxysilane, a disulphide or a thiol group.

13. Process according to claims 11 or 12 wherein the initiator comprises a group chosen from azo groups, peroxo groups, or a ketone group in conjugation with an aromatic system.

14. Process according to claim 13, wherein the initiator comprises a group chosen from aromatic ketones or aromatic ketones containing sulphur.

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15. Process for the detection of sample nucleic acid molecules, using a polymer monolayer according to claim 7 or 8, which comprises the steps of

a) allowing a hybridization reaction to take place between the probe and the sample, followed by
b) removal of the non hybridized nucleic acid molecules in a washing step and
c) detection of the hybridized nucleic acid molecules.

16. A process for purifying a compound from a sample comprising the steps of

(a) contacting the sample with the polymer monolayer of any of claims 1 to 8, under conditions that allow binding of said compound to the functional group of the polymer chain or the probe molecule;
(b) and removing material from the sample that has not bound to the polymer layer or a probe molecule;

17. The process according to claim 16 further comprising

(c) eluting the bound complex from the polymer layer.

18. The process according to claim 16 or 17, wherein said compound is a nucleic acid, a (poly)saccharide or a (poly)peptide or a complex thereof, preferably an antibody or a fragment or derivative thereof.

19. Use of the surface according to claims 9 or 10 as an affinity matrix.

20. Use of a surface according to claims 9 or 10 in a sensor chip.

21. Medical or diagnostic instrument, comprising a surface according to claims 9 or 10.

22. Use of a surface according to claims 9 or 10 for the immobilization of starter molecules for the formation of oligo- or polymers, preferably for nucleic acid or peptide synthesis.

23. Use of polymer layer according to any of claims 1 to 8 as a gel in the separation of molecules in an electric field.

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